

## 21<sup>st</sup> Century Students: Who they are, what we know about them, and what we need to know about them

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## Beloit College Mindset for the Class of 2010

- **What do our students know?**



The Soviet Union has never existed

"Google" has always been a verb



Smoking has never been permitted on U.S. airlines

A coffee has always taken longer to make than a milkshake

## What do we know about our students?

- Browse pp. 65-66 in your notebook. Is there something there that your students "know" that you didn't?
- Briefly share your finding with someone at your table.

<http://www.beloit.edu/~pubaff/mindset/>

## Starting Points

- Identify one striking way your students differ from students you first taught.
- Compare your observation with someone else at your table.
- Briefly discuss whether or not you have changed your approach to teaching and learning because of this.

## Focus of our plenary

- What do we know about who starts college in STEM?
- What do we know about who graduates with undergraduate STEM degrees?

See pages 67-68 for additional resources on our topic

## We offer a snapshot view of a continually morphing student landscape


- Demographics are changing
  - An inclusive workforce enhances the probability of finding truly creative solutions in a global economy (Paraphrased from plenary talk by Gary Rodkin, CEO ConAgra, at Teaching and Learning in Undergraduate Education Summit, 10-6-06)
- Advances in learning sciences/cognitive psychology are informing teaching (breakout IB).
- Federal and state policy changes affect prior learning of students who enter our classroom (National Science Standards are 10 years old).



## What do we need to know before fall semester?

**Jillian Kinzie** - What we know about students' learning experiences through the undergraduate years


**John H. Hall** – Are there social behaviors, including communication, that are common to successful STEM students, including those from underrepresented groups?



### Essential Demographics of Today's College Students


(from Condition of Education 2007)

- **Enrollments projected to continue to increase**
- **Changes in proportions of student populations: female, full-time, & those attending 4-year institutions**
- **Women are now in the majority**
  - **56% female vs. 42% male**
- **There are more older students on campus**
  - **39% were 25 years or older in 1999**
  - **28 % were 25 years or older in 1970**
- **60% of “Non-trads” participate in distance education**
  - 1999-2000, 8% of all undergrads participated in distance education will increase with more non-trads



## Minority Student Enrollments

- **In 2002:**
  - Black students were more than **twice as likely** as Hispanic students to attend an institution where they made up at least 80% of total enrollment
    - 12% of Black students attended HBCU's
    - 47% of Hispanic students attended HSI's
  - 29% of students enrolled in degree-granting institutions were racial/ethnic minorities – American Indian, Asian/Pacific Islander, Black, or Hispanic.
  - 24-26% of students at 4-year institutions were minorities and 36% were minorities at 2-year institutions.



### Top 30 Postsecondary Courses

- **Core curriculum stable for 3 decades**
  - **21 courses** appeared in top 30 for each cohort
  - 6 courses each from humanities & languages, science & mathematics, social sciences & business, music performance, physical education activities, & student teaching
- **Highly selective institutions** added engineering & humanities courses, and courses with international theme
- Business courses common to **selective and non-selective institutions**
- Student teaching and physical education only in **nonselective institutions** list

## Remedial Coursetaking

- **Postsecondary institutions**
  - provided remedial coursework for **28%** of entering freshmen in 2000
    - 22% in mathematics
    - 14% in writing
    - 13% in reading
  - Freshmen at public institutions more likely to enroll than those at private institutions
- **2-Year Institutions**
  - students most likely to enroll in remedial courses (**42% vs. 12-24%** at other types of institutions)

### 21<sup>st</sup> Century Students and the College Experience

- College-going stakes higher today than at any point in history
- Need to provide high-quality postsecondary education to more than three-quarters of the adult population
- 45% students in 2yr-colleges depart during their first year, & 1 of 4 leave from 4-yr schools
- Enrollment & persistence rates of historically underserved students lagging
- 51% of high school grads have reading skills necessary for college; 25% of students in 4-yr colleges need 1 yr of remedial coursework



### What We Know About the Undergraduate Experience from NSSE

#### National Survey of Student Engagement (NSSE)



- ❖ Annual survey that assesses the extent to which students engage in educational practices associated with high levels of learning and development
- ❖ Results provide estimate of how first-year and senior students spend their time & what they gain from attending college NSSE items represent empirically confirmed 'good practices'; behaviors associated with desired outcomes of college
- ❖ 1,100 baccalaureate institutions; 275,000 students annually



### What do students do?

1. What percent of full-time first-year students study, on average, more than 20 hours per week?

(a) 12% (b) 18% (c) 30% (d) 41%

**b. 18% NSSE FY; 20% STEM FY**  
(slightly higher for STEM FY and SR,  
*but not much*)



### Worrisome Gap? Time spent studying

- First-year students average about 13-14 hrs. per week studying
- Faculty Survey of Student Engagement (FSSE) data indicate that faculty expect students to spend more than twice that amount preparing (estimated 24-30 hrs. a week for FT)
- Entering first-year students EXPECT to study more than they actually do in college



### What do students do?

2. What percent of first-year students frequently ("very often" + "often") worked with classmates OUTSIDE OF CLASS to prepare class assignments?

(a) 28% (b) 34% (c) 40% (d) 58%

**c. 40% NSSE FY; 49% STEM FY**  
Significant difference persists with Seniors




### What do students do?

3. What percent of senior students frequently ("very often" + "often") made a class presentation?


(a) 28% (b) 34% (c) 40% (d) 58% (e) none of the above

**e. 66% NSSE SR; 55% STEM SR**  
**34% NSSE vs. 26% STEM for FY**



## Active and Collaborative Learning Scales

- **Active Learning Scale**
  - Asked questions in class
  - Make a class presentation
  - Participated in a community-based project (service learning) as part of a regular course
- **Collaborative Learning Scale**
  - Worked with peers on projects during class
  - Worked with classmates outside of class to prepare assignments
  - Tutored/Taught other students
  - Discussed ideas from readings or classes with others outside of class (students, family)




## What do students do?

4. True or False.

More STEM FY and SR students attended an art exhibit, gallery, play, dance, or other theater performance than NON-STEM students.

**FALSE**

33% NSSE FY vs. **21% STEM FY**  
28% NSSE SR vs. **16% STEM SR**





## What do students do?

5. What percent of first year students report they frequently (“often or very often”) emailed their instructor?

(a) 34% (b) 45% (c) 54% (d) 63% (e) 75%

e. 75% NSSE FY, 85% NSSE SR  
**about the same for STEM**

## FSSE & NSSE Comparison Prompt Feedback

	Lower Division	Upper Division
 FACULTY gave prompt feedback often or very often	93%	93%
	1 <sup>st</sup> yr. Students	Seniors
 STUDENTS received prompt feedback often or very often	53%	64%

## Senior Student Engagement Scales: STEM vs. Non-Stem

- **Gains in Practical Competence** +
- Gains in Personal & Social Development =
- **Gains in General Education** -
- **Higher Order Learning** +/-
- **Integrative Learning** -
- **Reflective Learning** -
- Satisfaction =
- Academic Challenge =
- Active & Collaborative Learning =
- Student Faculty Interaction =
- Enriching Educational Experiences =
- Supportive Campus Environment =

## NSSE Educational Gains Items



- **Gains in Practical Competence**
  - Work related knowledge
  - Using computer and info technology
  - Solve complex real world problems
- **Gains in General Education**
  - writing, speaking effectively
  - Thinking critically, analytically
  - Acquiring broad general education

## Deep Learning Items: Higher-Order Learning



Students indicate how much (1 = "very little" to 4 = "very much") their coursework emphasizes:

- Analyzing the basic elements of an idea, experience, or theory, such as examining a particular case or situation in depth and considering its components
- Synthesizing and organizing ideas, information, or experiences into new, more complex interpretations and relationships
- Making judgments about the value of information, arguments, or methods, such as examining how others gathered and interpreted data and assessing the soundness of their conclusions
- Applying theories or concepts to practical problems or in new situations

## Deep Learning Items: Reflective Learning



Students indicate how often (1 = "never" to 4 = "very often") they did the following during the current school year:

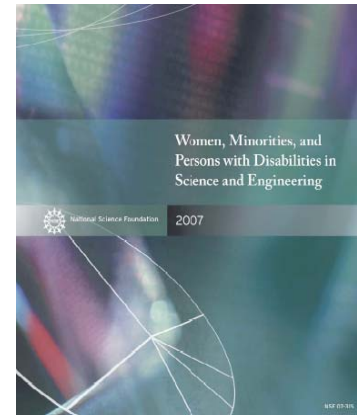
- Examined the strengths and weaknesses of your own views on a topic or issue
- Tried to better understand someone else's views by imagining how an issue looks from his or her perspective
- Learned something that changed the way you understand an issue or concept

## Deep Learning Items: Integrative Learning



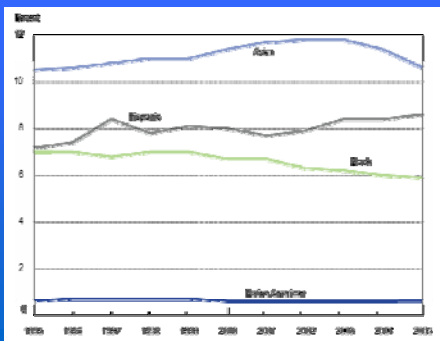
Students indicate how often (1 = "never" to 4 = "very often") they did the following during the current school year:

- Worked on a paper or project that required integrating ideas or information from various sources
- Included diverse perspectives (different races, religions, genders, political beliefs, etc.) in class discussions or writing assignments
- Put together ideas or concepts from different courses when completing assignments or during class discussions
- Discussed ideas from your readings or classes with faculty members outside of class
- Discussed ideas from your readings or classes with others outside of class (students, family members, co-workers, etc.)



<http://www.nsf.gov/statistics/wmpd>

## Minority undergraduate engineering students, by race/ethnicity: 1995–2005



SOURCE: Women, Minorities and Persons With Disabilities in Science and Engineering (December 2006)

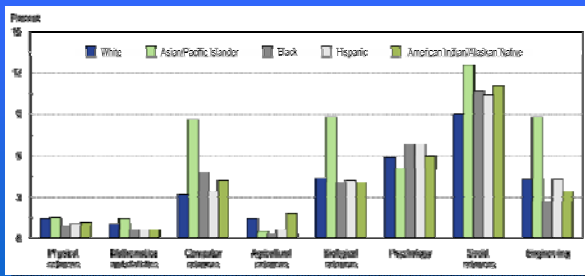
TABLE B-8. Intentions of freshmen to major in S&E fields, by race/ethnicity and sex: 2004 (Percent)

Race/ethnicity and sex	All S&E majors	Biological/ agricultural sciences	Computer sciences	Engineering	Mathematics/ statistics	Physical sciences	Social behavioral sciences
All race/ethnicities	33.1	9.3	2.0	9.6	0.7	2.3	10.2
Female	29.3	9.0	0.4	2.9	0.6	1.9	11.5
Male	40.8	7.4	4.1	17.9	1.0	2.9	7.5
White	30.1	7.0	1.9	9.0	0.8	2.3	9.1
Female	22.9	7.7	0.3	2.7	0.7	1.9	10.6
Male	38.7	6.4	3.9	17.0	1.0	3.0	7.4
Asian	45.5	16.1	2.2	15.1	0.9	2.4	8.8
Female	37.6	18.0	0.8	6.6	0.8	2.0	10.6
Male	54.3	14.1	4.1	25.8	1.0	2.6	6.7
Black	34.3	9.5	3.3	7.7	0.5	1.8	11.5
Female	21.9	10.9	1.5	2.9	0.4	1.9	14.3
Male	38.2	7.5	6.2	15.1	0.6	1.7	7.1
Hispanic of Mexican/Chicano/Puerto Rican descent	37.2	9.3	2.2	10.8	0.7	1.6	12.6
Female	31.7	10.4	0.5	3.1	0.7	1.3	15.6
Male	45.0	7.9	4.5	21.0	0.8	2.1	8.7
Other Hispanic	38.3	9.1	1.8	10.2	0.9	1.9	14.4
Female	32.6	10.4	0.7	3.4	0.7	1.6	17.0
Male	45.1	7.4	3.4	20.0	1.1	2.7	10.9
American Indian	33.8	6.6	2.2	7.6	0.5	2.5	12.1
Female	29.4	9.0	0.5	2.9	0.5	2.1	14.4
Male	40.7	8.2	4.7	15.2	0.7	3.2	8.7

NOTE: Includes first-year students at all 4-year colleges. Race/ethnicity categories are those used in the survey's data collection.

SOURCE: Higher Education Research Institute, University of California at Los Angeles; Survey of the American Freshman: special tabulations (Los Angeles, CA, 2005).

### Bachelor's degrees awarded to racial/ethnic groups in S&E fields: 2004



SOURCE: Women, Minorities and Persons With Disabilities in Science and Engineering (December 2006)

### NSSE Connecting the Dots Finding: Compensatory Effect of Engagement

**- Student engagement positively related to FY and senior student grades and to persistence between the first and second year of college at the same institution**

**- Engagement has compensatory effect on FY grades and persistence to the second year of college.**



### Behaviors and Success in STEM Careers

John H. Hall  
Morehouse College

### Your Students

- List one skill or interest that you see in most of your students.
- List one skill or interest that you would like to see in most of your students that they presently do not have.
- List two behaviors that you consider to be crucial for success in STEM careers.

### What We Want to Know

- Do successful STEM students express certain behaviors that contribute to their success?
- Are these behaviors teachable?
- How long do we have to teach the behaviors before a student's personality is fixed?
- Is there variance in these behaviors across racial, ethnic or gender lines?

### The Method

- Birkman Assessment
- Used in industry and business for 50 years.
- Longitudinal studies



## Uses

- Coaching and development
- Effective interpersonal relationships
- Effective management training
- Career guidance

## How it differs

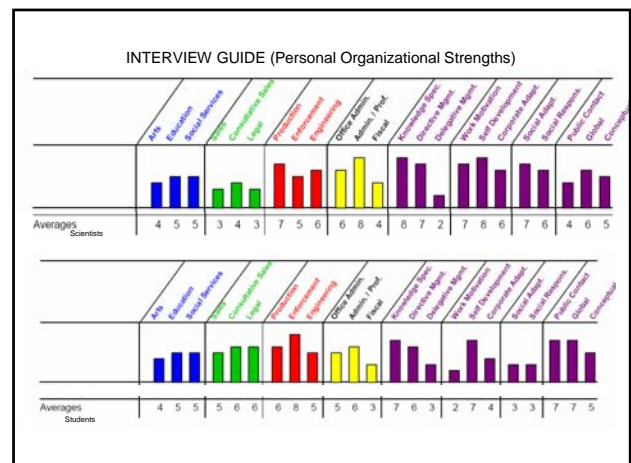
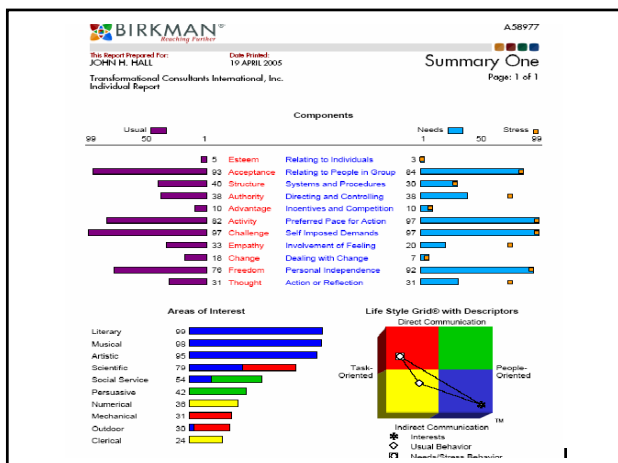
- A behavioral assessment
- Does not put people into groups.
- Speaks to the individual
- Comparison with societal norms
- Extremely accurate

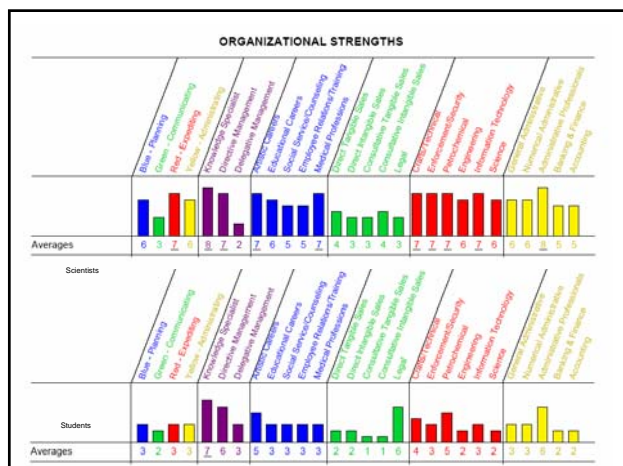
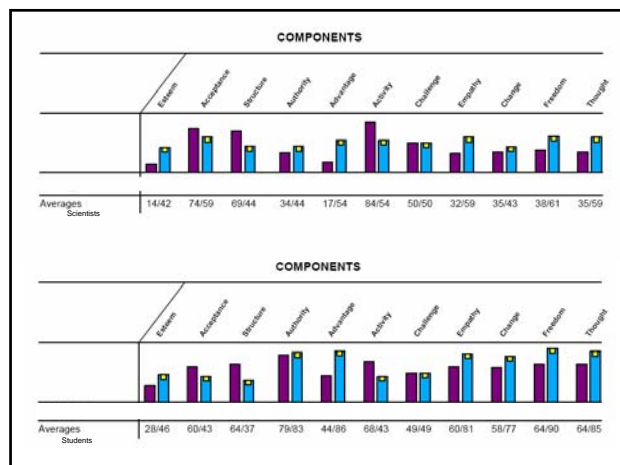
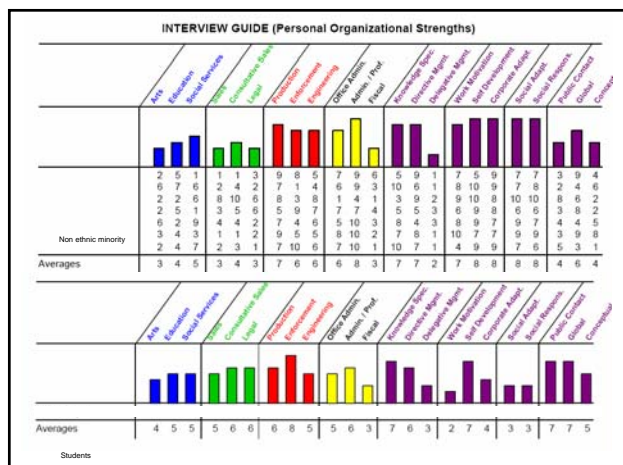
## What it doesn't do

- Measure intelligence
- Provide clinical diagnosis
- Identify abnormal behaviors
- Identify weaknesses
- Measure motivation
- Assess attitudes

## What Behaviors?

- Usual Behaviors
  - Our most comfortable ways of behaving; they produce the most success in the most satisfying ways.
- Needs
  - Behaviors that we need from others and the environment in which we work.
- Stress Behaviors
  - what we do when we are not getting our needs met. Usually, these behaviors increase stress and we are not as productive as when we are in our Usual Behaviors.





## Preliminary Findings

- There are statistically relevant differences in the Social Adaptability and Social Responsibility results when compared to successful scientists.
- Students differ from established scientists in Authority and Change; this appears to be a societal trend.
- Students differ from established scientists in Advantage; this has not been established as a societal trend.

## So What?

- Transforming education in the STEM disciplines – it is a cultural change.
- Coaching and Mentoring of Students
  - Differing perceptions of motivation
  - Differing interests

If you would like to participate . . .

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## Discussion and Questions



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